MAN-10100-001 Rev. C00

SUNRISE TELECOM
INCORPORATED

SunLite® E1

User's Manual

SS265

Sunrise Telecom®...a step ahead

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⚠WARNING

Using the supplied equipment in a manner not specified by Sunrise Telecom may impair the protection provided by the equipment.

SunLite E1 User's Manual
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Important Safety Information

⚠**WARNINGS:**

- Use NiMH batteries only.
- Use SA143 or equivalent AC adaptor to charge the NiMH batteries.
- Use only Sunrise Telecom 120-21011-120 replacement NiMH batteries

Operating Environment

This test set is intended for operation in at least partly weather protected and temperature controlled locations, as per IEC 721-3-7, Class 7K2. Do not operate this test set in rain, or in a direct water splash environment.

Input Connectors

These connectors are intended for connection to E1 circuits only.

- Maximum input voltage is 12VDC.

Dip Switch Information

The six dip switches, located in the battery compartment (see Figure 6), are intended for factory test and programming use. They should be left in the positions indicated in the following figure for normal operation.

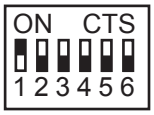


Figure 1 Dip Switch

1 General Description

Welcome to the SunLite E1. This compact, lightweight, and versatile test set allows you to perform many E1 tests. Accept a circuit, check for quality, observe signalling information; the SunLite E1 performs all of these functions and more via a simple keypad-oriented user interface. This manual will introduce you to the SunLite E1. You will be led through test setup and shown how to perform applications.

If you have questions, please call your distributor or Sunrise Telecom's Customer Service department.

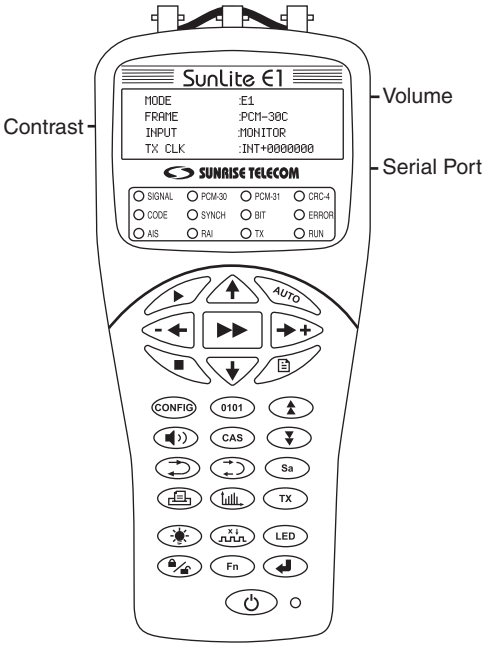


Figure 2 SunLite E1, Front View

1.1 LED Panel

Just below the LCD screen is a group of LEDs (see Figure 3). Most of these LEDs reflect received information. A flashing red LED indicates an error or alarm has occurred in the past, but is no longer occurring, press LED to clear.

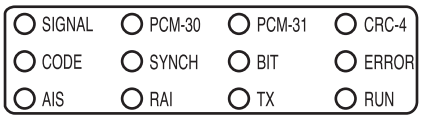


Figure 3 LEDs

SIGNAL

- Green: Receiving E1 pulses.
- Red: Not receiving pulses.

PCM–30, PCM–31

- Green: Receiving framing as expected.
- Red: Framing expected, not received.

CRC-4

- Green: CRC-4 received as expected.
- Red: CRC-4 expected, not received.

CODE

- Red: Code error received.

SYNCH

- Green: Synchronized on received test pattern.
- Red: Synchronization has not been achieved.

BIT

- Red: Bit error received.

ERROR

- Red: Code, bit, bitslip, CRC-4, E-bit, or Frame error received.

AIS

- Red: Receiving an unframed all ones signal (Alarm Indication Signal).

RAI

- Red: Remote Alarm Indication received.

TX

- Green: Transmitting.
- Flashing green: Transmitting in self-loop mode.
- No light: Not transmitting.

RUN

- Green: Measurements are being taken.

Power

Located to the right of the ⏻ power key.

- Red: Battery running low.
- Green: Test set is fully charged and/or plugged into the adaptor.

1.2 Keys

The test set has two sets of keys. The central set controls the most basic functions. The lower portion controls specific functions and actions.

Notes

- When ▶▶ (scroll) has been released for more than a second, the parameters are set.
- The - ◀ cursor left/decrease key, decreases the internal clock frequency (for clock calibration) and the timeslot selection in VF measurements, as well as moves the cursor in the indicated direction.
- The ▶ + cursor right/increase key, increases the internal clock frequency (for clock calibration) and the timeslot selection in VF measurements, as well as moves the cursor in the indicated direction.
- Repeatedly pressing ■ (stop) will have no affect.

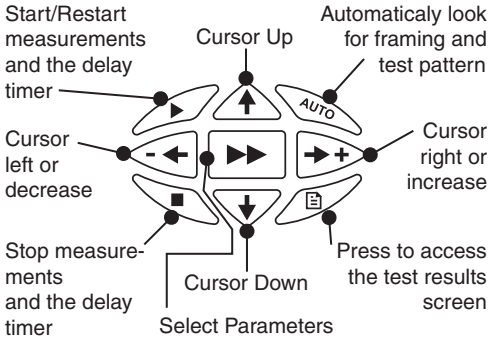


Figure 4 Center Keys

Lower group of keys

The following keys are shown in Figure 2

(CONFIG): Displays the configuration screen.

(0101): Displays the test pattern screen.

(▲): Page up through available screens.

(🔊): Displays VF measurements.

(CAS): View the Channel Associated Signalling on the received line.

(▼): Page down through available screens.

(⮌): Send the Loop Down code selected in the Loop codes screen in the (Fn) menu.

(⮎): Send the Loop Up code selected in the Loop codes screen in the (Fn) menu.

(Sa): View the status of the received Sa 4-8 bits.

(🖶): Print the screen. If viewing results or VF measurements, all screens will be printed. In profiles, the selected profile will be printed.

(📊): Displays histogram screens.

(TX): Turn the transmitter on/off, or to enter the self-loop mode.

(☀): Turn the backlight on/off.

(⎍): Inject an error on the transmitted signal.

(LED): Press to clear blinking LEDs.

(🔒): Press the lock/unlock key once to lock all keys. The test set will beep once, and its settings cannot be changed. Press the key twice, the keys will be unlocked, and the test set will beep twice.

(Fn): Access the function menu to set various parameters.

(↵): Execute a specific action.

(⏻): Turn the test set on/off. Note that if you quickly turn the test set on after turning it off, you may see static for a moment. It will clear and the normal start up screen will appear.

1.3 Connectors, Controls, and Back Side

This section describes the connectors and controls available on the test set.

Top Panel

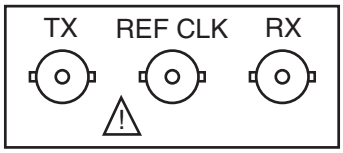


Figure 5 SunLite E1 Top Panel

⚠WARNING

The connectors on this panel are intended for connection to E1 circuits only, as defined in EN60950. Maximum input voltage: 12VDC.

- TX: 75Ω unbalanced BNC connector; transmits the E1 signal from the test set.
- REF CLK: BNC reference clock input connector; plug a 2.048 Mbit/s, AMI or HDB3, reference clock signal in here.
- RX: 75Ω unbalanced BNC connector; receive the E1 signal here.

Right Side

- Volume Control: Adjusts speaker volume.
- Serial Port: This RJ-11 serial port is used to connect a printer or download firmware.

Left Side

- Contrast Control: Adjusts screen contrast.

Bottom Side

- 5VDC: Plug the power adaptor here. The test set may be operated with a discharged battery, provided the charger is connected. The battery will charge during operation.

Back Side

This side of the test set contains :

- Speaker
- Microphone
- Battery Compartment

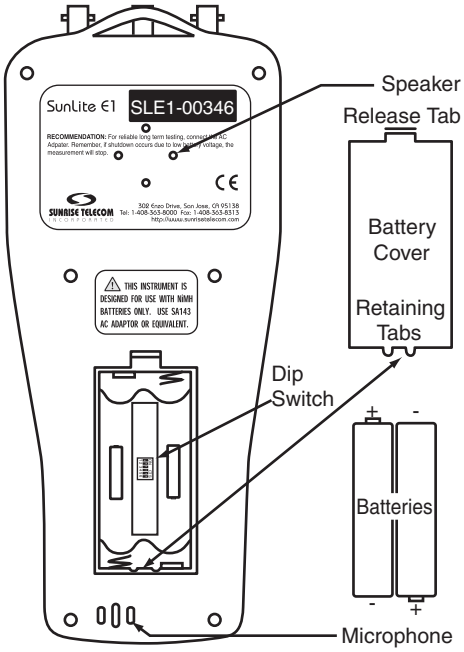


Figure 6 Sunlite E1 Back View

1.4 Batteries

The test set's internal batteries are accessed through the back of the test set. Refer to Figure 6 and the following instructions on changing the batteries.

⚠ WARNING

- Use NiMH batteries only.
- Use SA143 or equivalent AC adaptor to charge the NiMH batteries.
- Use only Sunrise Telecom 120-21011-120 replacement NiMH batteries.

Replacing the NiMH batteries

1. Remove the battery compartment cover by pressing the Release tab towards the center of the cover and then lift the cover off.
2. Remove the old batteries by pushing each battery against the spring and lifting upward. You may need a flat tool, such as a small screw driver to accomplish this.
3. Insert the new batteries by pressing the negative end of each battery against the spring (as indicated in the battery compartment) and push each battery into place.
4. Replace the cover by inserting the retaining tabs into their slots and then gently push the cover down into place.

2 Basic Definitions

Here are some abbreviations you will run into, and their definitions.

AIS: Alarm Indication Signal—an all 1s signal on the line. Indicates loss of signal or other severe problem.

HHH: MM:SS: hours: minutes: seconds

LT: Line Termination

LVL: Level

PMP: Protected Monitoring Point

RAI: Remote Alarm Indication; notice that an alarm has occurred at the far end of the line

UI: Unit Interval; This is the time it takes to transmit 1 bit; .488 ms at 2.048 Mbit/s

mS: Microsecond

VF: Voice Frequency

3 Menus

The test set is key driven. The following table shows the organization of the keys and their options. To select a menu, press it's corresponding key. If you get lost in a menu, press the same key to start over.

Key	Page	Options or Screens
CONFIG	15	MODE
	16	FRAME
	19	INPUT
	19	TxCLK
0101	20	Test Patterns
TX	22	MODE
	23	SUMMARY
	24	SIGNAL/FREQUENCY
	25	ERRORS
	28	SIGNAL ERRORS
	28	FRAMING RAI
	29	G.821
	31	G.826
	32	M.2100/550
Fn	33	TIME & DATE
	33	SET IDLE CODES
	34	PRINT PERIOD
	34	PROFILE
	35	TEST DURATION
	36	TEST RESULTS
	37	DELAY TIMER
	38	SEND FRAME WORDS
	39	M.2100 PARAMETERS
	39	CLK CALIBRATION
	40	AUDIBLE ALARM
	40	ERROR INJECTION
	41	LOOP CODES
	42	ERASE NV RAM
	43	COMPANDING
	43	PROPAGATION DELAY
	44	LINE CODING
	44	FREQ. RESOLUTION
	45	AUTO STRESS
	45	LANGUAGE SELECTION
	45	LINE TERMINATION
	46	ALARM GENERATION
	46	G.821 ALLOCATION
	47	VIEW RECEIVED DATA
	48	VF Setup and Measurements
CAS	50	Observe Channel Associated Signalling on all 30 channels.
	51	Histogram measurements
Sa	52	Observe Sa-bit status

4 Menu Parameters

This section will guide you in the key, menu, and option selections for setting up the test set. Technology Notes provide information about the technology behind the choices, and are enclosed in frames.

On power up, the test set does a self test, after which it displays the Version/Option screen. Press CONFIG to begin configuration. Use ←, and → to move to the cursor (_). Press ▲ and ▼ to scroll between screens. Press ▶▶ to select options.

4.1 CONFIG (Configuration) Key

Before connecting, configure the test set.

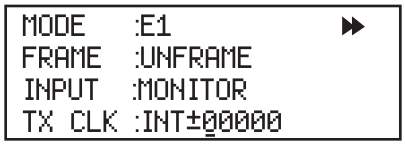


Figure 7 Set Up Screen

MODE

Select the test rate.

Options: E1, Nx64k

- E1: Test at a full 2.048 Mbit/s.
- Nx64k: Test at fractional testing. If Nx64k is selected, the timeslot selection screen is displayed after pressing ▼ or ▲.

Figure 8 PCM-30 Timeslot Screen

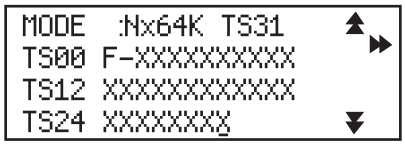


Figure 9 PCM-31 Timeslot Screen

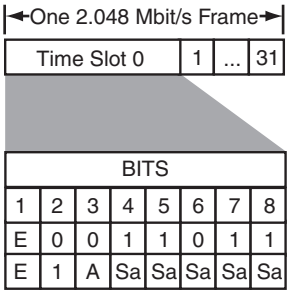
1. Use ←, →, ↓, and ↑ to select the desired timeslot. The selected timeslot is underlined. Timeslots 0 and 16 will be skipped in PCM-30, and TS 0 will be skipped in PCM-31. The active timeslot is underlined (TS 4 in Figure 8, TS 31 in Figure 9). – = Unused timeslots, X = Active timeslots
2. Press ▶▶ to select and deselect timeslots.
3. Press ⏬ or ⏫ to return to the configuration screen.

Technology Note: E1 Rate
The E1 signal is transmitted at a rate of 2.048 Mbit/s. The rate is achieved by multiplexing 32 individual 64 kbit/s bitstreams (timeslots in the 2.048 signal).

FRAME
Select the desired framing type.
Options: PCM-30, PCM-30C, PCM-31, PCM-31C, UNFRAME

Notes:
- Press AUTO to have the test set auto-synch on the received E1 framing.
- A 'C' added to PCM-30 and PCM-31 indicates enabling of CRC-4 error checking.

Technology Note: E1 Framing
E1 transmission utilizes two main types of framing, Frame Alignment Signal (FAS), and MultiFrame Alignment Signal (MFAS). The next two figures show a graphic representation of these types of framing.



Notes:
- 8 bits per timeslot x 8000 frames per second = 2.048 Mbps
- Even Frame: Contains Frame Alignment Signal (FAS).
- Odd Frame: No Frame Alignment Signal (NFAS).
- Sa: This bit is reserved for National Use.
- E: This is the error indication bit.
- A: This is remote alarm indication bit (FAS).
- 0011011: Frame Alignment Signal

Figure 10 FAS Framing Structure

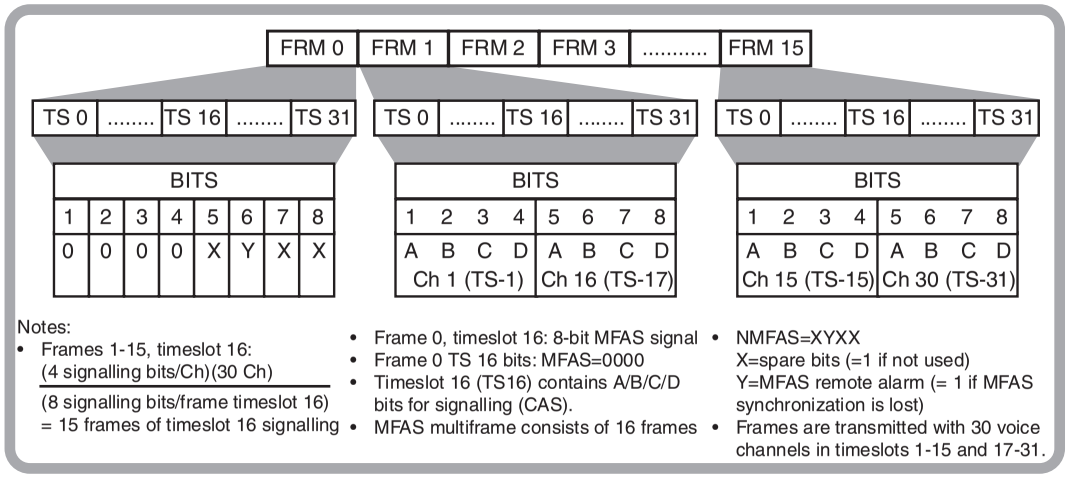


Figure 11 MFAS Frame Structure

INPUT
Select the receiver level.
Options: TERM, HI-Z, MONITOR

- TERM: Terminates the line.
- HI-Z: Configures the test set for high impedance mode.
- MONITOR: Use when connecting the test set to a PMP.

TxCLK
Select the transmit clock source.
Options: INTERNAL, EXTERNAL, RECEIVED, IN+/- XXXXX ppm or Hz

Note: If the test set does not have the clock offset option, this setting is fixed at INTERNAL.

- INTERNAL: Uses the test set's internal 2.048 MHz +/- 25 ppm clock.
- IN+/-XXXXX: Use to shift the internal transmit frequency, in ppm (up to 24400 ppm) or Hz (up to 50000 Hz). To do so:

1. Press →+ to move the cursor to each digit position.
2. Use ▶▶ to select a digit from 0 to 5 for the first position, and from 0 to 9 for the remainder.
3. Press any key to exit the screen.

- EXTERNAL: Use an external frequency source connected to the test set REF CLK input to provide timing for the transmitted E1 signal.
- RECEIVED: Recovers the clock from the received signal and uses it as your TxCLK.

4.2 (0101) (Test Pattern) Key

Select or create a test pattern. The pattern is transmitted on the non-selected channels.

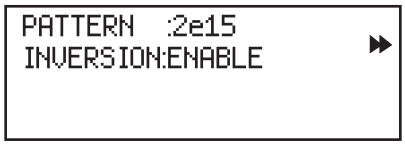


Figure 12 Test Pattern Selection Screen

PATTERN

Options: 2e15, 2e9, 2e11, 2e23, 1111, 0000, 1010, RICAR 3, User 1, User 2, User 3, LIVE, LOOP

- Select a standard test pattern; 2e15, 2e9, 2e11, 2e23, 1111, 0000, 1010, or RICAR 3.
- LIVE: This option has the test set stop looking for a test pattern, and simply measure the live signal. The test set will transmit idle code in all channels.
- LOOP: Transmits the received signal.

Figure 13 User Test Pattern Screen

- Select and Enter a User Pattern by:

1. Pressing ▶▶ to select User1, User2, or User3.
2. Select the third line of the screen (as in Figure 13) and at each bit location, press ▶▶ to select 0, 1, or none (-). A user pattern may be from 1 to 16 bits long. Select “none” in the middle of the pattern, and all remaining bits will be set to “none.”

INVERSION

Choose whether to send the test pattern in an inverted form (1s and 0s reversed).

Options: DISABLE, ENABLE

Technology Note: Standard Test Patterns

$2e^n$-1, where n = 9, 11, 15, 20, 23: are pseudo-random bit sequences. The signal is formed from a 9, 11, 15, 20 or 23-stage shift register and is not zero-constrained. The patterns conform to the ITU O.151 technical standard.

1111: The all 1s pattern is used for stress testing circuits. If the pattern is sent unframed, it will be interpreted as an AIS.

1010: This is the alternating ones and zeros pattern. The pattern is frame aligned with “f” showing the location of the framing bit. The pattern is: f 0101 0101.

0000: This is the all zeros pattern. If the circuit is AMI, the pattern synch and/or signal will be lost.

RICAR 3: Fixed 24 bit pattern used in France. The pattern is: 1000 1000 1000 1111 1111 1111.

4.3 (TX) (Transmit) Key

Determine the test set's transmitter status.
Options: TX ON, TX OFF, SELF-LOOP

Figure 14 Transmitter Screen

- TX ON: Activates the transmitter.
- TX OFF: Deactivates the transmitter.
- SELF-LOOP: The test set sends its transmit signal directly to its receiver, in order to verify the test set is configured properly and is able to achieve pattern synchronization, before connecting to the line.

4.4 (Results) Key

Press to view test results. There are a number of screens, including counts and percentages.

Taking Measurements

1. Set up the configuration screen and press TX.
2. Press ▶ and the RUN LED will turn green.
3. During measurement, Fn, CONFIG, 0101, TX, , and are deactivated.
4. Press ■ to stop measurements. The RUN LED will turn off.
5. Press to see test results.

- Many results are available in percentage formats as well as counts. Press ▶▶ to access these results. For example, the G.821 screen shows EF, UAS and AS counts. Press ▶▶ and the screen shows %EFS, %UAS, %AS.
- Press and to page through the measurement results screens.

Summary Results

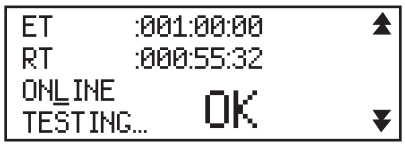


Figure 15 Summary Results Screen

- Overall summary (OK; no errors or alarms detected).
- **ET**: Elapsed Time since pressing ▶. This is reset to zero after pressing ■, then ▶.
- **RT**: If the test is timed, this shows the Remaining Time of the test in Hours: Minutes: Seconds. If the test is continuous it will display "---:--:--".

Signal/Frequency Results

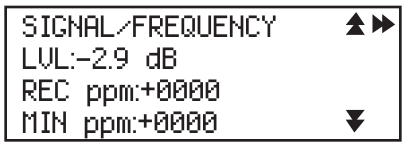


Figure 16 Signal/Frequency Results Screen

- **LVL**: Negative and positive level of the pulses being received by the test set. Measurements are from the base of the pulse to its peak, and are displayed in decibel variance from DSX level (dB).
- **REC ppm**: Received frequency variance from 2.048 MHz in parts per million. For example, if the received frequency is 2048010.24 Hz, the test set will report 2048010.24/5 ppm. Press ▶▶ to see in Hz.
- **MIN ppm**: Minimum frequency variance value which has been measured in parts per million. Press ▶▶ to see in Hz.

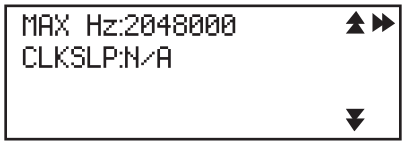


Figure 17 Frequency Results Screen

- **MAX HZ:** Maximum frequency measured since the beginning of the test. This variance is shown in both Hz and ppm. Scroll to the next screen to see the measurement in ppm.

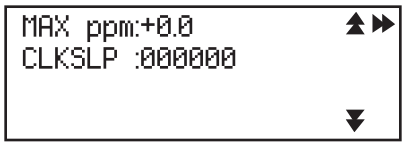


Figure 18 Frequency in ppm Screen

- **CLK SLP**: Number of clock slips since the beginning of the test. A clock slip occurs when the measured frequency deviates from the reference frequency by one unit interval.
  Note: If there is no reference frequency, CLK SLP is reported as N/A.

Errors

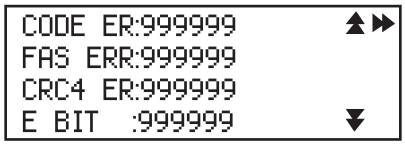


Figure 19 Error Screen

- **CODE ER**: Count of the number of code errors since the beginning of the test.
- **FAS ERR**: Count of Frame Alignment Signal errors.
- **CRC4 ER**: Count of the number of CRC-4 errored blocks since the beginning of the test. This measurement is N/A when the test set is not synchronized on a received CRC-4 multiframe.
- **E BIT**: Count of the number of E-bits which have been received since the beginning of the test.

Note: Press ▶▶ to see the error rates, as in Figure 20:

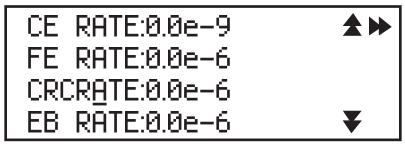


Figure 20 Error Rates Screen

Technology Note: CRC-4

The equipment which originates the E1 data calculates the CRC-4 bits for one submultiframe. It inserts the CRC-4 bits in the next submultiframe. The receiving equipment performs the reverse mathematical computation on the submultiframe. It compares the transmitted and calculated values. If there is a discrepancy in the two values, a CRC-4 error is reported.

Each CRC-4 error does not necessarily correspond to a single bit error. Multiple bit errors within the same submultiframe will lead to only one CRC-4 error for the block. Also, it is possible that errors could occur such that the new CRC-4 bits are calculated to be the same as the original bits.

CRC-4 uses a multiframe structure consisting of 16 frames, as shown in the next figure. The CRC-4 multiframe is not necessarily aligned with the MFAS multiframe. Each CRC-4 multiframe can be divided into 2 sub multiframes (SMF). These are labeled SMF#1 and SMF#2 and consist of 8 frames apiece. We associate four bits of CRC information with each submultiframe.

M-FRM	SM-FRM	FRM	Time Slot 0							
			Bit							
			1	2	3	4	5	6	7	8
	1	0	c1	0	0	1	1	0	1	1
		1	0	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		2	c2	0	0	1	1	0	1	1
		3	0	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		4	c3	0	0	1	1	0	1	1
		5	1	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		6	c4	0	0	1	1	0	1	1
		7	0	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
	2	8	c1	0	0	1	1	0	1	1
		9	1	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		10	c2	0	0	1	1	0	1	1
		11	1	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		12	c3	0	0	1	1	0	1	1
		13	E	1	A	Sa4	Sa5	Sa6	Sa7	Sa8
		14	c4	0	0	1	1	0	1	1
		15	E	1	A	Sa4	Sa5	Sa6	Sa7	Sa8

Notes:

- SM-FRM+1: Sub-Multiframe #1
- Sa: Spare bit reserved for National Use
- A: Remote Alarm (FAS Remote Alarm Indication)
- Frame Alignment Signal Pattern: 0011011
- CRC-4 Frame Alignment Signal: 001011
- CRC multiframe is not aligned with MFAS timeslot 16 multiframe
- SM-FRM 2: Sub-Multiframe #2
- E: E-bit Errors
- c1, c2, c3, c4: CRC bits

Figure 21 CR-4 Multiframe Format

Technology Note:
E-bit Performance Monitoring

When the terminal equipment of a 2.048 circuit is optioned for CRC-4 transmission, E-bit transmission may also be enabled. The terminating equipment transmits E-bits on the 2.048 Mbit/s line, when it receives a CRC-4 error. E- bit error transmission is a relatively new feature in 2.048 transmission. E-bit transmission allows a 2.048 Mbit/s in-service circuit to be reliably monitored for transmission performance from any point on the circuit.

Signal Errors

Figure 22 Signal Errors Screen

- **LOSS**: Loss of Signal Seconds is the number of seconds during which the signal was lost during the test.
- **LOFS**: Loss of Frame Seconds is a count of seconds in the test which experience a loss of framing.
- **SYLS**: Count of the number of pattern Synchronization Lost Seconds, since the beginning of the test.
- **AIS**: Count of the number of seconds since the beginning of the test in which the test set received an AIS (all 1s) signal.

Framing RAI

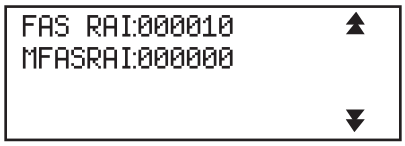


Figure 23 Framing RAI Screen

- **FAS RAI**: Count of the seconds during which Frame Alignment Signal Remote Alarm Indication was received.
- **MFAS RAI**: Count of the seconds during which Multiframe Alignment Signal Remote Alarm Indication was received.

G.821 Results

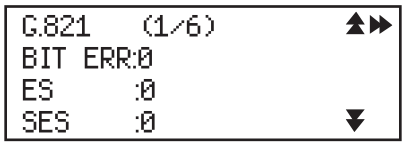


Figure 24 G.821 Results Screen 1

- **BIT ERR**: Count of Bit Errors received since the beginning of the test. BER in the percentage screen is Bit Error Rate.
- **ES**: Count of Errored Seconds received since the beginning of the test. An errored second is any second with at least one BPV, bit error, FBE, or CRC-4 error.
- **SES**: Count of the Severely Errored Seconds received since the beginning of the test. An SES has an error rate of 10^{-3} or higher.

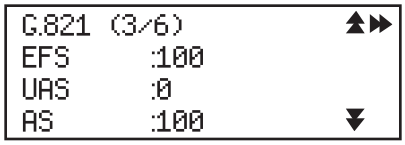


Figure 25 G.821 Results Screen 2

- **EFS**: Count of Error Free Seconds since the beginning of the test.
- **UAS**: Count of Unavailable Seconds since the beginning of the test. This begins at the onset of 10 consecutive SES, or at a loss of signal, frame, or pattern.
- **AS**: Count of Available Seconds, which is the length of the total test time, minus any UAS.

Notes:

- The G.821 standard is set in (Fn)/G.821 ALLOCATION.

- When the LIVE pattern is selected, G.821 measurements will be reported as N/A, as in the following figure:

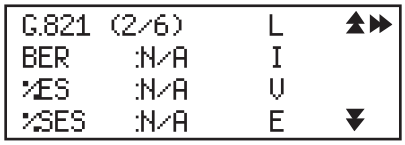


Figure 26 G.821 LIVE Screen

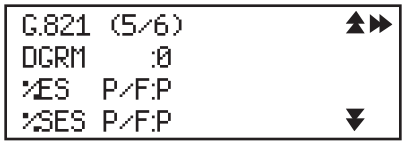


Figure 27 G.821 DGRM Screen

- **DGRM**: Count of Degraded Minutes; a block in which there is a 10^{-6} bit error rate during 60 available, non-severely errored seconds.
- Press ▶▶ to see the results in a percentage format.
- **%ES P/F**: Reports “PASS” or “FAIL” for the G.821 %ES standard.
- **%SES P/F**: Reports “PASS” or “FAIL” for the G.821 %SES standard.

G.826 Results

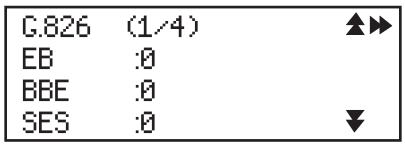


Figure 28 G.826 Measurements Screen 1

- **EB:** Count of Errored Blocks, which contain bit errors.
- **BBE**: Count of Background Block Errors. A BBE is an EB not occurring during an SES.
- **SES**: Count of Severely Errored (block) Seconds. An SES containing equal or greater than 30% EBs.
- Press ▶▶ to see the results in a percentage format.

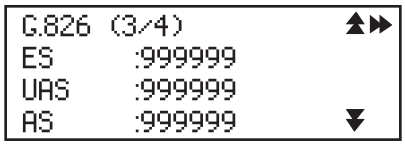


Figure 29 G.826 Measurements Screen 2

- **ES:** Count of Errored Seconds.
- **UAS:** Count of Unavailable Seconds.
- **AS:** Count of Available Seconds.

M.2100/550 Results

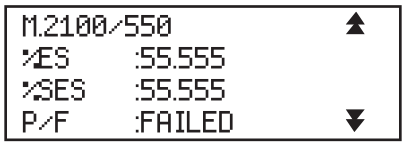


Figure 30 M.2100/550 Results Screen

Measurements are based on the MEASUREMENT PERIOD and HRP MODEL %, which is set via Fn.

%ES: Percentage of Errored Seconds which have occurred since the start of the test.

%SES: Percentage of Severely Errored seconds which have occurred since the start of the test.

P/F: Specifies whether the M.2100/550 test is "PASS" or "FAIL" for the specified HRP MDEL% and time period.

4.5 (Fn) (Function) Key

Select function parameters from six screens.

Figure 31 Function Menu Screen 1

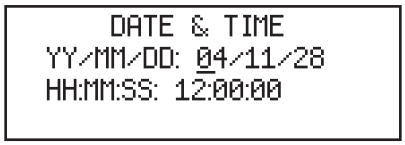


Figure 32 Date & Time Screen

TIME & DATE

Set the current time and date in the set.

1. Press ◄- or -► to place the cursor.
2. Press ▶▶ to select and set each digit.
3. Press ▼ or ▲ to select the other line.
4. Press (Fn) to return to the Function menu.

SET IDLE CODES

Determine the pattern the unit will send on unused channels. Channel Associated Signalling (CAS) idle code is also set in this screen.

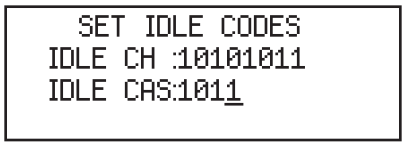


Figure 33 Set Idle Codes Screen

1. Press ◄- or -► to place the cursor.
2. Press ▶▶ to select and set each digit.
3. Press ▼ or ▲ to select the other line.
4. Press (Fn) to return to the Function menu.

Note: The default idle code is 00000000, the default idle CAS is 1101.

PRINT PERIOD

Determine when the test set will send results to the serial port to be printed.

Options: NOW, 5 MIN, 15 MIN, 1 HR, 24 HRS, LAST, EVENT, OFF

- NOW: The results are printed every time (print) is pressed.
- 5 MIN, 15 MIN, 1 HR, or 24 HRS: Results are printed every time the selected period of time has passed.
- LAST: Results are printed when the measurements are finished, or stopped.
- EVENT: Prints a event report.
- OFF: Disables the print function.

PROFILE

Save or invoke a system profile. A system profile includes configuration and function parameters. The test set will power up using its last configuration.

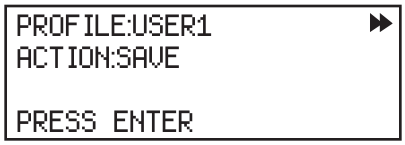


Figure 34 Profile Screen

Options: USER1 to USER10, CURRENT

Action: SAVE, RECALL, DELETE, PRINT

- USER1 to 10: The following actions are available:
  - SAVE: Use to save the Current Profile via the following procedure:
  1. Press ▶▶ to select a USER number for the name of the profile.
  2. Press ▼ to select ACTION.
  3. Press ▶▶ to select SAVE.
  4. Press (enter).

Note: If 10 profiles are stored, any new profile will overwrite a previous profile.

- PRINT: Use to print a profile by:

1. At PROFILE, select a USER profile.
2. Press ↓ to select ACTION.
3. Press ▶▶ to select PRINT.
4. Press ↵.

- RECALL: Activate a Stored Profile by:

1. At PROFILE, select a USER profile.
2. Press ↓ to select ACTION.
3. Press ▶▶ to select RECALL.
4. Press ↵.

- DELETE: Remove a Stored Profile

1. At PROFILE, select a USER profile.
2. Press ↓ to select ACTION.
3 Press ▶▶ to select DELETE.
4. Press ↵.

- CURRENT: Prints the current profile. This is the only action available.

The next Function menu screen contains:

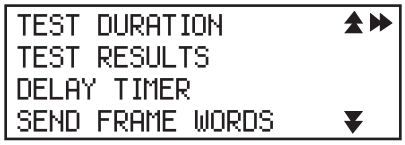


Figure 35 Function Menu Screen 2

TEST DURATION

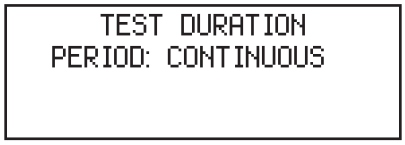


Figure 36 Test Duration Screen

This screen contains the following:

PERIOD

Determine the measurement duration.

Options: CONTINUOUS, 15 MIN, 1 HR, 12 HRS, 24 HRS, PROG

- CONTINUOUS: Test will run until ■ is pressed.
- 15 MIN, 1 HR, 12 HRS, 24 HRS or PROG: Select a timed period or choose a duration time by selecting PROG and then:
  1. Press ▼ to select the DD/HH/MM line.
  2. Press ▶▶ to select a digit to use.
  3. Press ◀- or +▶ to move the cursor.
  4. Press (Fn) to return to the Function menu.

TEST RESULTS

View, print, delete, label, or lock/unlock measurement test results.

Options: RESULTS: 1 through 10

ACTION: VIEW, PRINT, DELETE, NONE, LOCK, UNLOCK

Create or Edit a Results Label

At the RESULTS line, rename the label with a name up to eight characters long.

1. Press ▶▶ to move through the saved test results. At a test of interest press +▶ and the cursor will move under the first character.
2. Press ▼ and ▲ to move through the characters at the RESULTS label line.
3. When you have selected a character to use press +▶ to enter the character and move the cursor to the next character.
   - Leave a blank space by moving the cursor without choosing an entry.
   - Press ▶▶ while on a character to erase all characters to the right of it.
   - Clear the entire label by pressing ▶▶ with the cursor at the left of the label.

4. When done, move the cursor to the left of the label and the label is stored.

TEST RESULTS ACTION Choices

1. Select the test results of interest.
2. Press ▼ to select the ACTION line.
3. Press ▶▶ to choose an action, then press ↵ to carry out the selected action

- If DELETE is selected, a warning message is displayed, press ↵ to delete, press any other key to escape and keep the test.
- Press 🖶 after selecting ACTION PRINT to print the selected test results.
- A "START MEASUREMENTS FIRST" message is displayed if you attempt to print, save, view, or delete records when no measurements have been made.
- The date and time of a result is displayed at the bottom of any saved results screen.
- Press 🔒 to prevent changes, press it again to unlock the saved test.

DELAY TIMER

Set a start time before measurements begin.

Figure 37 Deley Timer Setup Screen

Options: MODE: ON, OFF

Press ▶▶ to select OFF/ON. If ON, START is available. Enter the delay desired (01 minutes - 99 hours, 99 minutes), by pressing ▶▶ to select a digit and -◀ / ▶+ to move the cursor. Press ▶ and the countdown screen is displayed as in Figure 38. Measurements will begin when the delay has expired. Press ■ to cancel.

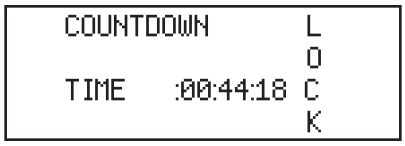


Figure 38 Delay Timer Countdown Screen

SEND FRAME WORDS

Modify the frame words, if desired.

- E-bit: 00, 01, 10, 11, AUTO (where the test set replies to an incoming CRC-4 error).
- FAS W: Modify the first bit, to 1 or 0.
- MFAS: Modify bits 5-8, to 0 or 1.
- NFAS: Modify the Si (bit 1), A-bit (bit 2), and Sa bits (4-8). When no CRC-4 is detected, Si is set to 1. You may set the NFAS words for 8 frames (1, 3, 5, 7, 9, 11, 13, 15).

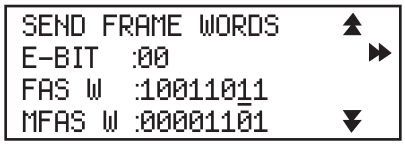


Figure 39 Send Frame Words Screen

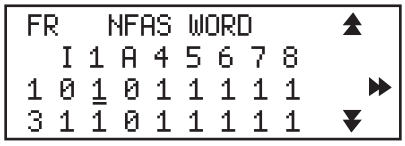


Figure 40 Send NFAS Frame Words Screen

- Factory defaults: E-bit-Auto; MFAS-00001101, NFAS-I, bit=1, A=0, Sa 4-8=1111.

Here is the next Function menu screen:

Figure 41 Function Menu Screen 3

M.2100 PARAMETERS

Set M.2100/550 parameters.

HRP% Options : 00 to 99%

PERIOD Options: 1 MIN, 15 MIN, 1 HR, LAST

Figure 42 M.2100/550 Parameters Screen

1 At HRP%, press ▶▶ to enter a digit, press -◀/▶+ to move the cursor.
2. At PERIOD, press ▶▶ to select a period.

CLK CALIBRATION

Set the internal clock frequency.

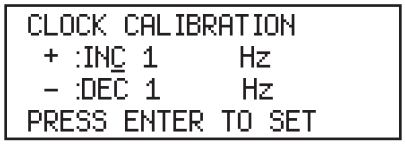


Figure 43 Clock Calibration Screen

1. Press CONFIG and set TX CLK: INT+/-00000.
2. Connect the TX port to a calibrated unit or an external frequency counter.

- If using an external frequency counter, change the LINE CODING in Fn to AMI, then select 1111 PATTERN in 0101.

3. Press →+/-← to increase or decrease the internal clock frequency in 1 Hz steps.
4. Look at the frequency counter or calibrated unit to check the alignment.
5. Continue until the frequency is measured at 2048000 Hz, if using a calibrated unit, or at 102400 (half the frequency) if using an external frequency counter.
6. Press ↵ to set the calibration.

AUDIBLE ALARM

Options: ON, OFF

If ON, a beep sounds during an error or alarm.

ERROR INJECTION

Set the error injection parameters.

- TYPE: BIT, CODE, BIT&CODE, CRC-4, FRAME, EBIT, ZEROES
- MODE: RATE, BURST (dependent on error type)
- RATE: $1x10^{-2}$ to $1x10^{-7}$
- ZEROES: 8, 16, 24....128
- BIT=1-50
- BIT+CODE=1-16

1. Press ▶▶ to select the type of error to inject.
2. For all errors except for ZEROES, FRAME, and EBIT, use BURST to inject a single error. Use RATE to insert a continuous stream of errors at a given rate, then press ▶▶ to select the rate in the following screen:

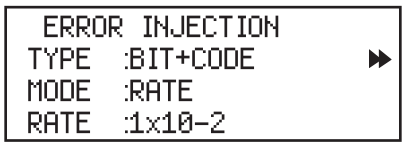


Figure 44 Error Injection Screen

3 Select RATE to pick the injection rate.

4. Press (x1) and errors of the specified TYPE and COUNT or RATE are injected.

- If ZEROES is selected as the error TYPE, the mode will be BURST. The test set will inject consecutive zeroes in the test pattern to the selected INSERT NUMBER.
- Select FRAME or EBIT errors, and a single error is injected at a time.

Here is the next Function screen:

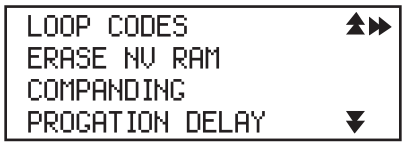


Figure 45 Function Menu Screen 4

Technology Note: Standard Loopbacks

Loopback 1 is based on ETR 001. Sa6 bits have a 1111 code. When the loopback is complete, the Sa5 bit sent from the digital switch to the terminal equipment will be 0.

Loopback 2 is based on ETS 300 011. Sa6 bits have a 1010 code, and the Sa5 bit received after the loopback is complete will be 0.

LOOP CODES

Select the loop code to be transmitted after pressing (→) or (←).

Options: TYPE: PATTERN, STANDARD: LOOPBACK 1, LOOPBACK 2

SA BIT: SA4 through SA8

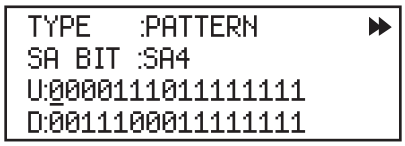


Figure 46 Loop Code Screen

1. Decide whether to send a standard loop code, or to enter your own pattern:

- If you choose to send a STANDARD pattern, you have two choices:
  - Loopback 1 is a complete, transparent loopback located in the LT.
  - Loopback 2 is a complete, transparent loopback located in the NT1.
- If you choose PATTERN, enter the code you want to send:
  - Choose the Sa bit, from Sa4 to Sa8.
  - Enter the Up and Down loopback codes, using ▶▶ to select between 1 and 0.

2. The loopback codes will be sent when you press the appropriate key. See Figure 47 for a sample screen:

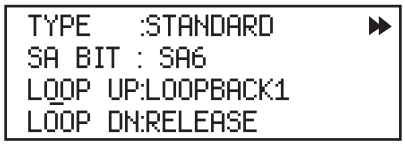


Figure 47 Loopback Screen

3 Press ⏎ to take the loop down. After the loopback release is complete, the Sa5 bit sent to the TE will be set to 1.

ERASE NV RAM

Use this function as a last resort if the test set is not functioning properly. Initiate Erase NV RAM only after making sure the test set is configured properly. Press ⏎ to start.

Note: All user-stored information will be erased.

COMPANDING

Select the companding characteristic.

Options: A-law, U-law

Technology Note:

Companding Characteristic

An 8-bit code word is formed by comparing the amplitude of the analog sample to a companding characteristic. The companding characteristic is a formula which translates the amplitudes of the 8000 Hz samples (voice to digital) into the 8-bit code words. Internationally, a companding characteristic known as “A-law” is used. A-law intends to provide optimum signal-to-noise performance over a wide range of transmission levels. In North America, the encoding is done according to the μ-law. Therefore, the companding law used for encoding the voice signal must match that for decoding, for distortion-free transmission.

PROPAGATION DELAY

Measure the propagation delay on a looped back signal.

1. The circuit must be looped at the far end to perform this measurement. If no loopback is in place, you will see a warning message.
2. Press ↵ to start measuring.
3. The measurements are displayed in Unit Intervals and micro seconds.

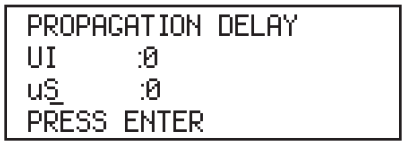


Figure 48 Propagation Delay Screen

Here is the next Function menu screen:

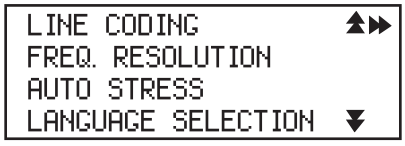


Figure 49 Function Menu Screen 5

LINE CODING
Set the line coding.
Options: HDB3 (default), AMI

Figure 50 Line Code Selection Screen

FREQ. RESOLUTION
Set the frequency resolution of the measurement.

Options: 1 HZ, 0.1 HZ, 0.01 Hz

1 Hz is the default setting. In order to have a frequency resolution of 0.1 or 0.01 Hz, the test set will take 10 or 100 seconds to show the actual value, and will update the value every 10 or 100 seconds.

AUTO STRESS
Test a looped back signal.

The test set will change the frequency in steps to both the maximum and minimum frequencies until bit and/or code errors are received. Press ↵ to begin testing with the following screen:

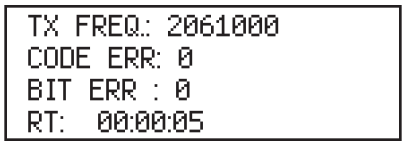


Figure 51 Auto Stress Results Screen

LANGUAGE SELECTION

Choose the test set's working language.

Options: English, French, Italian, German

Here is the final Function menu screen:

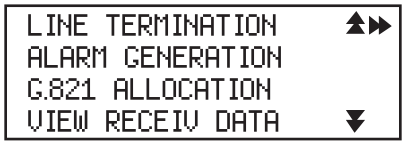


Figure 52 Function Menu Screen 6

LINE TERMINATION

Adjust the calibration table for signal level measurement, depending on the unit's installed interface.

Options: 75 OHM, 120 OHM

Technology Note: Alarms

AIS: Generated upstream in response to a loss of signal.

FAS RAI: Frame Alignment Signal Remote Alarm Indication. Indicates upstream loss of FAS framing. Framing required.

MFAS RAI: Multiframe Remote Alarm Indication. Indicates upstream loss of MFAS framing. Only with PCM-30 framing.

ALARM GENERATION

If desired, choose an alarm to generate for network testing.

Options: AIS, FRAI, MFRAI

- Press ▶▶ to ENABLE or DISABLE each alarm. Remember to DISABLE all alarms when you are through testing.

G.821 ALLOCATION

Program certain G.821 threshold parameters to be met in the Results.

Options:

- SES: G.821, $1.0x10^{-3}$ – $9.9x10^{-9}$
- DGRM: G.821, $1.0x10^{-3}$ – $9.9x10^{-9}$
- HRX: 15, 30, 70, 85, 100, OFF

In order to enter your own values in the following selections, press ▶▶ to increase the value of the digit you have selected. Press →• to move cursor within the rate.

- **SES**: Severely Errored Seconds
  - Select G.821, and the threshold is set to the G.821 standard of $1x10^{-3}$.
  - Use the ▶▶ and ↵ keys to enter your own standard.
- **DGRM**: Degraded Minutes
  - Select G.821, and the threshold is set to the G.821 standard of $1x10^{-6}$.
  - Use the ▶▶ and ↵ keys to enter your own standard.
- **HRX**: Define the portion of the international connection.
  - The default setting is OFF.
  - Use the ▶▶ and ↵ keys to enter your own standard.

VIEW RECEIVE DATA
View the data received at the RX port.

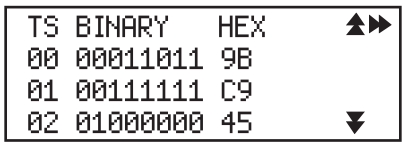


Figure 53 View Received Data Screen

- The data for each timeslot (TS) is displayed in binary and hexadecimal formats.
- Press ⏬ to view all of the timeslots.

4.6 (VF Measurements) Key

Press to access Voice Frequency functions.

- The speaker turns on automatically.
- Framing is required for VF functions.
- You can monitor a voice channel, and observe various results.
- Only available with the VF hardware option.

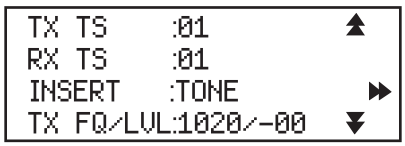


Figure 54 VF Screen 1

Options: TX TS (Transmit Tmeslot): 1 to 31

RX TS (Receive Timeslot) 1 to 31

INSERT: TONE, TALK, QUIET

Tx FQ/LVL: 0 to 3999 Hz/ +3 to -60 dBm

1. Select the Tx TS, the timeslot you want to transmit on, using and .
2. Select the Rx TS, the timeslot you want to receive and take measurements on, using and .
3. Select one of the following:

- TONE: Inserts a tone on the selected Tx timeslot.
- TALK: Inserts your voice on the transmit signal via the test set's microphone.
- QUIET: Place a quiet termination on the transmit signal (a highly attenuated low frequency signal).

4. Set the Tx FQ (frequency, in Hz)/LVL (level, in dB). Press to change each number, and cursor to each digit.

Press to view the screen shown in Figure 55.

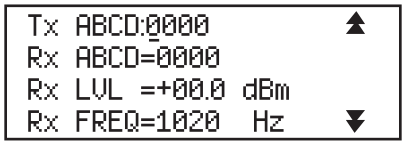


Figure 55 VF Screen 2

5. You may change the transmitted signalling (ABCD) bits at the first line. Press to select 1 or 0 for each position.
   Note: ABCD bits transmission requires PCM-30 or PCM-30C framing.
6. Observe the VF measurements:

- **Rx ABCD**: Received Channel Associated Signalling System (CAS) its. They are meaningful only with valid PCM-30 framing.
- **Rx LVL:** Received level, in dBm.
- **Rx FREQ**: Received frequency, in Hz.

Press ⏬ to view the screen shown in Figure 56.

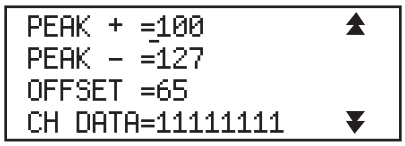


Figure 56 VF Screen 3

- **PEAK +**: Binary value of the codes that will produce the maximum decoder output level.
- **PEAK -**: Binary value of the codes that will produce the minimum decoder output level.
- **OFFSET**: Binary value of the difference between the code that is supposed to result from a zero-voltage input to the encoder, and the code that actually occurs.
- **CH DATA**: View the live 8-bit channel data.

Press ⏬ to view the screen shown in Figure 57.

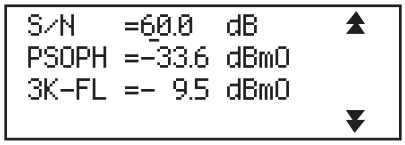


Figure 57 VF Screen 4

- **S/N:** Signal-to-Noise ratio, reported in dB.
- **PSOPH:** Psophometric filter measurement.
- **3K-FL:** 3-K Flat noise measurement.

4.7 CAS (CAS) Key

- Observe the Channel Associated Signalling on all 30 channels.
- You must have PCM-30/C framing or a "PCM-30 FRAMING REQUIRED" message is displayed if you attempt to enter CAS without proper framing.

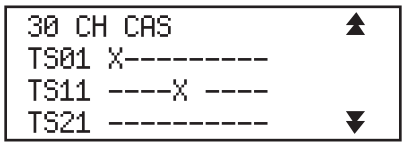


Figure 58 CAS Screen

- Timeslots 1 to 10 are shown on the first line, 11 to 20 on the second, and 21 to 30 on the third.
- Idle channels are marked with an –.
- Active channels are marked with a X.

4.8 (Histogram) Key

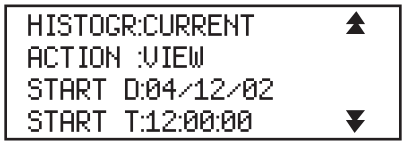


Figure 59 Histogram Menu Screen

View, print, or save a histogram.

Options: HISTOGR: CURRENT, SAVED

ACTION: VIEW, PRINT SAVE

1. Select a histogram to view by pressing ▶▶.
2. Select an ACTION:

- VIEW: Press ↵ and a Histogram data screen is displayed as in Figure 60.
- PRINT: Press ↵ and the histogram is printed.
- SAVE: Press ↵ and the measurement will be saved with a date and time stamp.
- To select the time period that the results will show, select PERIOD. Select from DAYS, HOURS, or MINUTES.

3. Observe the START and STOP times of the selected histogram.
4. Press ▶▶ to page through the errors.

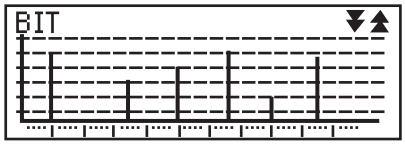


Figure 60 Histogram Measurements Screen

5. To choose which result you will see first, select TYPE and choose LOSS, AISS, LOFS, FAS RAI, MFAS RAI, BIT, CODE, or FE. In the Histogram screen, press ▶▶ to see all results.

6. Interpreting Measurements

- Horizontal axis: A period of time (day, hour, or minute) for every two dots.
- Vertical axis: Error count value every three dots, starting with 10, ending with 10,000,000.
- Press ▼ to see the period of time for the graphic screen.
- Press ▶▶ to go to the associated screens (for example, one day with one minute resolution will have 24 screens).
- The test set can show up to 24 pages of 1 hour with 1 minute resolution.
- Type: Error types: BIT, CODE, FE, LOSS, AISS, LOFS, FAS RAI, MFAS RAI.

  See *Section 4.4* for error definitions.

7. Press ■ to stop an in progress histogram analysis.

4.9 (Sa) (Sa Bits) Key

- Press (Sa) to observe Sa-bit status.
- The bits are reported horizontally, from Frame 1 through 15.
- Press (▼)/(▲) to view all screens.

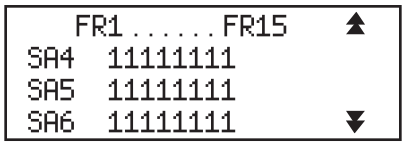


Figure 61 Sa-bits Screen

5 Firmware Upgrading

Use one of the following procedures to upgrade your firmware via the serial port.

5.1 CPU Download

1. On the DIP switch (DP1) inside the battery compartment, set SW 1, SW 2, SW 4, and SW 5 to ON (to the right).
2. Plug in the charger and turn on the power.
3. Run the program SUNLITEE1.EXE. Go to VIEW and select SEND MSG.
4. Click “OK” on all of the small windows. You will see a final display of “DOWNLOAD IS DONE. HAVE A NICE DAY!”
5. When done, turn off the test set and reset the DIP switch as shown in Figure 1.

5.2 FLASH Memory Download

1. On the DIP switch (DP1) inside the battery compartment, set SW 1 and SW 3 to ON (to the right).
2. Plug in the charger and turn on the power.
3. Select FLASH MEMORY and press ↵.
4. Run the program SUNLITEE1DLG.EXE. Click “OK” until you see “PROGRAMMING IN PROGRESS”. You will be asked to Erase NV RAM, press ↵ to complete.
5. When done, turn off the test set and reset the DIP switch as shown in Figure 1.

5.3 DSP Download

1. On the DIP switch (DP1) inside the battery compartment, set SW1 and SW 3 to ON (to the right).
2. Plug in the charger and turn on the power.
3. Select DSP and press ↵.
4. Run the program.
5. When done, turn off the test set and reset the DIP switch as shown in Figure 1.

6 Applications

Here is a list of a variety of the applications you can undertake with your test set. Accompanying each listing is a graphic showing you how to plug in.

6.1 Accept a New 2.048 Mbit/s Circuit

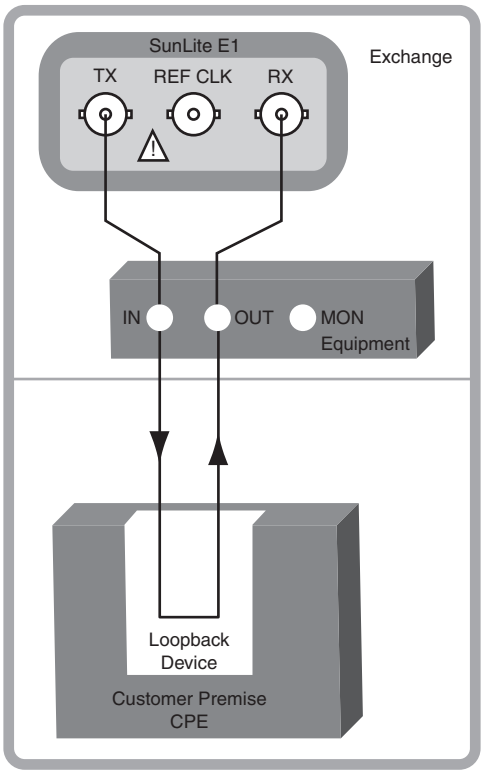


Figure 62 Accepting a New Circuit

6.2 Monitoring an In-Service Circuit

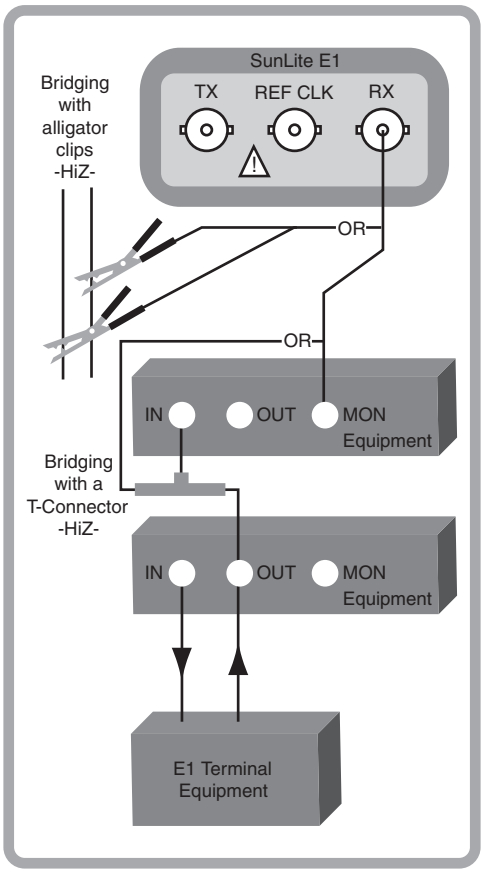


Figure 63 Monitoring an In-Service Circuit

6.3 Measuring Propagation Delay

1. Press CONFIG and configure the test set as required.
2. Connect to the circuit as shown in Figure 64.

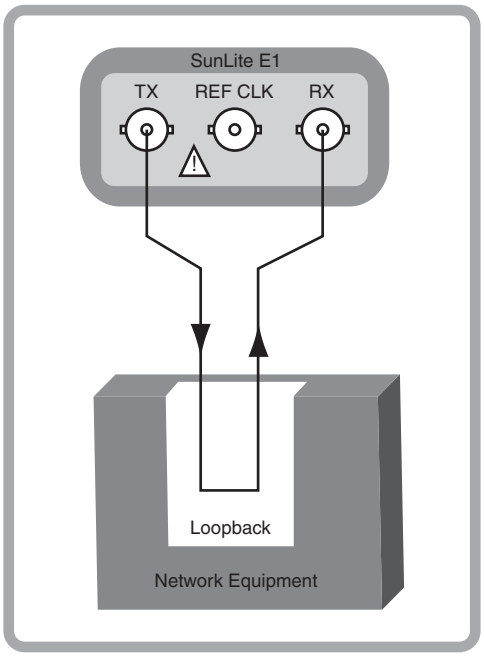


Figure 64 Propagation Delay

3. Press ▶ then press Fn.
4. Select PROPAGATION DELAY and press ↵.
5. Observe the delay on the looped circuit.

6.4 Frequency Synchronization

Set TxCLK to EXTERNAL when checking for frequency synchronization.

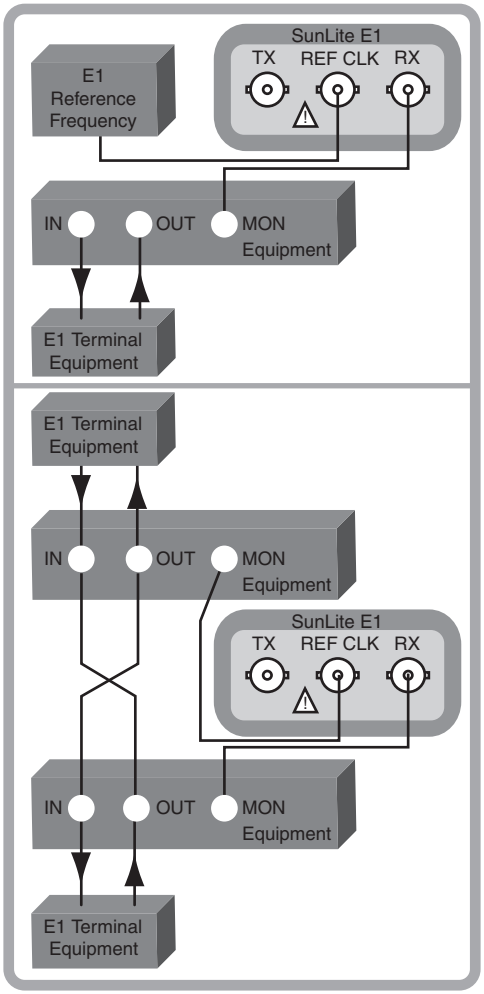


Figure 65 Frequency Synchronization

6.5 Measuring Signal Level

1. Press CONFIG and configure the test set as required.
2. Connect to the circuit as in Figure 66.

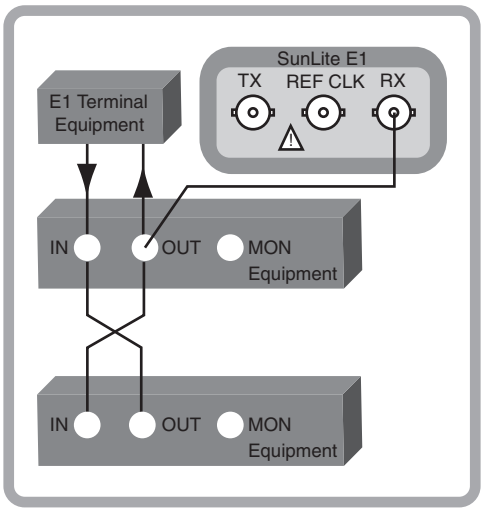


Figure 66 Measuring Signal Level

3. Press ▶ and then 🗎.
4. Page down to the SIGNAL/FREQUENCY screen and observe LVL (signal level).

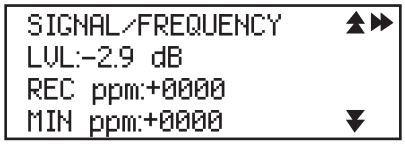


Figure 67 Signal/Frequency Screen

6.6 Channel Associated Signalling

1. Connect to the circuit as in Figure 63.
2. Press CAS and observe the Channel Associated Signalling for each timeslot, as in Figure 68.

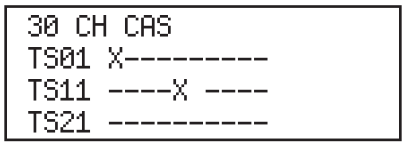


Figure 68 CAS Sample Screen

6.7 Voice Frequency Channel Monitoring

1. Connect to the circuit as in Figure 63
2. Press to access the VF screen shown in Figure 69.

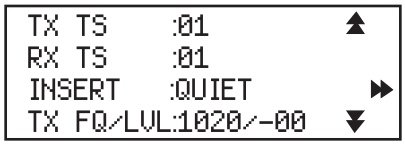


Figure 69 Voice Frequency Monitoring Screen

3. If necessary, change the transmit and receive timeslots.
4. Set QUIET for INSERT.

68 Send/Receive Digital Tones

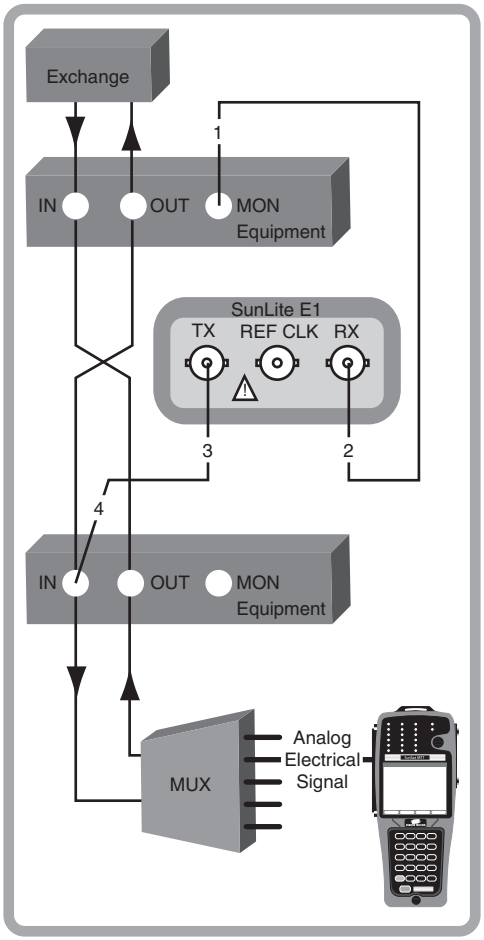


Figure 70 Insert a Hitless Digital Tone

1. Connect the cords in the order indicated.
2. Select TONE as the INSERT type in VF.

6.9 N (or M) x64 kbit/s Testing

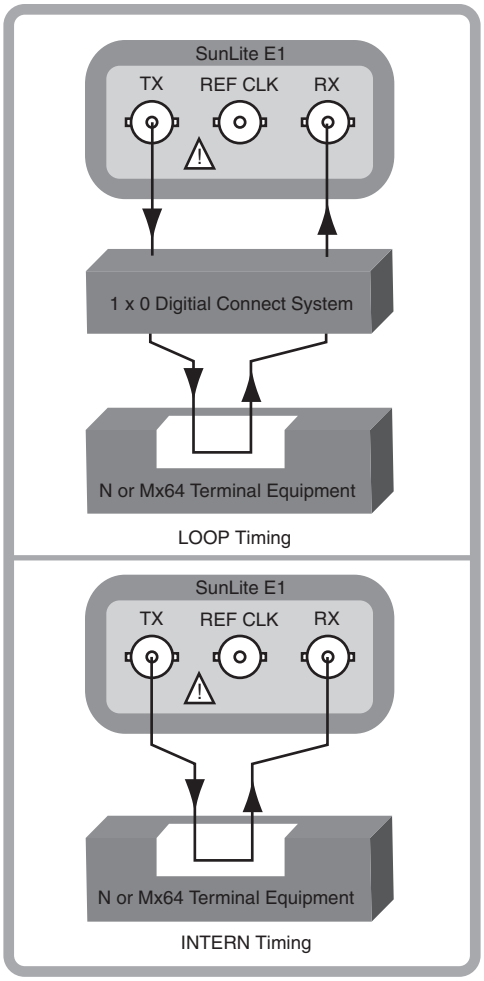


Figure 71 Fractional E1 Testing

7 Specifications

Note: This information is subject to change.

Connectors and Ports

2.048 Mbit/s E1 interfaces: Tx, Rx, Ext Clock

Standard: BNC (f), 75Ω unbalanced connectors

Optional: BR2 (f) 120Ω balanced connectors; Bantam (f) 120Ω balanced connectors

Serial Port: RS-232/v.24, RJ-11, 6-pin connector

Charger: 1 mm, DC jack

Status Indicators (LEDs)

13 super-bright LED indicators

Current status and alarm history

SIGNAL: red, no signal; green, signal; flash red, history, PCM-30 (bi-color), CRC-4 (bi-color), SYNC (bi-color)

TX: solid green, transmitter activated; flash green in self loop mode; off, transmitter de-activated

RUN: green, measurement running; off measurement stop

RAI: red, MFAS RAI or FAS RAI; flash red, history

AIS: red, AIS; flash, history

CODE: red, code error; flash, history

ERROR: red, CRC-4, E-bit, FAS E; flash, history

BIT: red, logical bit error; flash red, history

Power/low battery: slow flash green, power on and battery fully charged; solid green, battery being charged; red, low battery

E1 General

Bit Error test rates: 2.048 Mbit/s, N (contiguous) and M (noncontiguous) x64 kbit/s (N & M=1 to 31)

Drop and insert to internal test circuitry N or Mx64 kbit/s µ/A-law decoded VF channel to built-in speaker

Line Coding: HDB3 & AMI

Framing: Unframed, PCM-30, PCM-30C, PCM-31, PCM-31C. Conforms to ITU-T G.704

TEST PATTERN GENERATOR

General: 1111..., 0000..., 0101..., RICAR 3

PRBS: 2n-1, n= 9, 11, 15, 23. Conforms to ITU-T O.151, O.152, O.153, and ANSI V.52, V.57

Programmable: 3 patterns, each up to 16 bits long

Test pattern inversion

Transmitter

Clock source:

- Internal clock: 2.048 MHz ± 25 ppm
- Received: locked to received signal
- External: locked to Reference clock input signal

Line coding: HDB3 & AMI

Pulse shape: Conforms to ITU-T G.703. 75Ω/ Unbal.: ± 2.37 Vbp (±10%)

Programmable Timeslot 0: Programmable loop up/loop down code, and NFAS word

Set idle channel code and ABCD bits (IDLE/ NOT IDLE state)

Transmit signal can be turned ON/OFF or internally looped

Error injection: BIT, CODE, BIT+CODE, single or rate of $1x10^{-7}$ to $1x10^{-2}$ CRC-4, FRAME, E-bit: single 0-128 bit zero insertion in 8 bit steps

Receiver

Frequency range: 2.048 Mbit/s ± 6000 bit/s for SLE1

Input Sensitivity

- Terminate Hi-Z: 6 to -43 dB with Automatic Line Build Out (ALBO)
- Monitor: -20 dB resistive loss combined with -6 dB cable loss

Auto configuration for framing (PCM-30, PCM-30C, PCM-31, PCM-31C, Unframed), and test pattern

Impedances

- Terminate, Monitor: 75Ω unbalanced
- Hi-Z: > 2000Ω

Return loss performance according to ITU-T G.703

Jitter tolerance according to ITU-T G.823

External Clock Interface

Input Impedance: 75Ω Unbalanced

Input Sensitivity: -20 dB resistive loss combined with -6 dB cable loss

Line Coding: HDB3 & AMI

Measurements

E1 signal level: +0 to -43 dB resolution: 1 dB

Frequency measurement (Hz and ppm): Selectable frequency resolution (1 Hz, 0.1 Hz and 0.01 Hz) Current, Max, Min

Clock slips count

Code errors: error count and ratio

Frame errors: FAS and CRC-4 errors count and error ratios

Count of LOS, Loss of Sync (SYLS), LOF, AIS, FAS RAI, and MFAS RAI seconds

Bit errors: ITU-T G.821 analysis with allocation, programmable HRX%

ITU-T G.826 measurements

ITU-T M.2100 measurements (in conformance with M.2101)

E-bit errors: error count and ratio

Setup and test results printing

Test Duration, programmable

Print interval, programmable: NOW, 5 minute, 15 minute, 1 hour, 24 hours, LAST, EVENT, OFF

Time stamped events printing

Delay timer programmable up to 99 hours, 59 minutes.

Audible alarm: indicates an error or alarm, programmable ON/OFF

Alarm Generation: AIS, FAS RAI, MFAS RAI

Other Measurements

Save 10 test results, available to screen view or print with user defined label.

Histograms: G.821 basic measurements, up to 60 days of histograms, 1 day resolution and the last 24 hours with 1 minute resolution. 2 HISTOGRAMS stored; CURRENT and SAVED

Propagation Delay measurements in UI and µs, 1 µs resolution

Range: from 100 µs to 10 seconds

Voice Frequency Capability

Talk/listen by using the built-in microphone/ speaker

Companding: A-law or µ-law (selectable)

Monitor and CAS modes

ABCD bits display for a selected timeslot

CAS signaling monitoring (IDLE/NOT IDLE state)

Set ABCD bits to 1 or 0 of selected timeslot

Set CAS state IDLE/NOT IDLE

Set Idle Channel code

Frame Word Settings

Sa bits read, write with all 40 bits independently settable

Selectable loopback/release commands

Set Loop Up/Loop Down Sa4-8 bit code or transmit pattern

SLE-01 Clock Offset Option

Transmitter

Frequency programmable to 2.048 Mbit/s ± 24,400 ppm: 2.048 MHz

Accuracy: ± 2 ppm after external calibration

Receiver

Frequency range: 2.048 Mbit/s ± 24,400 ppm

Other measurements: Automatic stress automatically determines the receiving equipment's upper and lower frequency capture range

SLE1-02 VF Measurement Option

VF Measurement: 50 to 3950 Hz, 1 Hz Resolution; +3 dBm0 to -60 dBm0, 1 dB resolution

Send/Receive tone: 50 to 3950 Hz, res. 1 Hz; +3 to -60 dBm0, res. 1 dB

Noise (S/N, psophometric, 3K) level measurement: +3 to -60 dBm0

Digital representation of sinusoidal signals in a selected timeslot:

A-law and µ-law coding to ITU-T G.711

Coder offset and peak code measurement

Environmental

Operating temperature: 0° C to 50° C

Storage temperature: -20° C to +70° C

Humidity: 5% to 90% non-condensing

General

Store: Up to 10 instrument configurations
Display: 122 x 32 dots (4 x 20 characters, 6 x 8 dots size) with LED backlight
Internal Battery: NiMH rechargeable
Battery Life: 4 hours with transmitter off
Charge Time: 7 hours
Charger: 5V @ 2A, 90 to 265 VAC, 50-60 Hz
Languages: English, Italian, French, German
Size: 175 mm (l) x 75 mm (w) x 35 mm (d)
Weight: ~0.4 kg

8 Express Limited Warranty

A. Hardware Coverage. COMPANY warrants hardware products against defects in materials and workmanship. During the warranty period COMPANY will, at its sole option, either (i) refund of CUSTOMER'S purchase price without interest, (ii) repair said products, or (iii) replace hardware products which prove to be defective; provided, however, that such products which COMPANY elects to replace must be returned to COMPANY by CUSTOMER, along with acceptable evidence of purchase, within twenty (20) days of request by COMPANY, freight prepaid.

B. Software and Firmware Coverage. COMPANY warrants software media and firmware materials against defects in materials and workmanship. During the warranty period COMPANY will, at its sole option, either (i) refund of CUSTOMER'S purchase price without interest, (ii) repair said products, or (iii) replace software or firmware products which prove to be defective; provided, however, that such products which COMPANY elects to replace must be returned to COMPANY by CUSTOMER, along with acceptable evidence of purchase, within twenty (20) days of request by COMPANY, freight prepaid. In addition, during the warranty period, COMPANY will provide, without charge to CUSTOMER, all fixes, patches, new releases and updates which COMPANY issues during the warranty period. COMPANY does not warrant or represent that all software defects will be corrected. In any case where COMPANY has licensed a software product "AS-IS," COMPANY'S obligation will be limited to replacing an inaccurate copy of the original material.

C. Period. The warranty period for Hardware, Software and Firmware will be One (1) Year from date of shipment to CUSTOMER. The COMPANY may also sell warranty extensions or provide a warranty term of three years with the original sale, which provide a longer coverage period for the test set chassis, software and firmware, in which case the terms of the express limited warranty will apply to said specified warranty term.

D. Only for CUSTOMER. COMPANY makes this warranty only for the benefit of CUSTOMER and not for the benefit of any subsequent purchaser or licensee of any merchandise.

E. LIMITATION ON WARRANTY. THIS CONSTITUTES THE SOLE AND EXCLUSIVE WARRANTY MADE BY COMPANY WITH RESPECT TO HARDWARE, SOFTWARE AND FIRMWARE. THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED. COMPANY SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. COMPANY'S LIABILITY UNDER THIS AGREEMENT WITH RESPECT TO A PRODUCT, INCLUDING COMPANY'S LIABILITY FOR FAILURE AFTER REPEATED EFFORTS TO INSTALL EQUIPMENT IN GOOD WORKING ORDER OR TO REPAIR OR REPLACE EQUIPMENT, SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OR LICENSE FEE FOR THAT PRODUCT, NOR SHALL COMPANY IN ANY EVENT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, INDIRECT, OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, ARISING FROM OR

RELATED TO THE SALE OF THE MERCHANDISE HEREUNDER, INCLUDING BUT NOT LIMITED TO DAMAGES ARISING FROM OR RELATED TO LOSS OF BUSINESS, LOSS OF PROFIT, LOSS OF GOODWILL, INJURY TO REPUTATION, OVERHEAD, DOWNTIME, REPAIR OR REPLACEMENT, OR CHARGE-BACKS OR OTHER DEBITS FROM CUSTOMER OR ANY CUSTOMER OF CUSTOMER.

F. No Guaranty, Nonapplication of Warranty. COMPANY does not guaranty or warrant that the operation of hardware, software, or firmware will be uninterrupted or error-free. Further, the warranty shall not apply to defects resulting from:
   (1) Improper or inadequate maintenance by CUSTOMER;
   (2) CUSTOMER-supplied software or interfacing;
   (3) Unauthorized modification or misuse
   (4) Operation outside of the environmental specifications for the product;
   (5) Improper site preparation or maintenance; or
   (6) Improper installation by CUSTOMER.

9 Declaration of Conformity

Application of Council Directive(s):
- 89/336/EEC – the EMC directive

Manufacturer's Name:
- Sunrise Telecom Inc.

Manufacturer's Address:
- 302 Enzo Drive, San Jose, CA 95138 USA

Manufacturer's Telephone Number:
- TEL: (408) 363-8000, FAX: (408) 363-8313

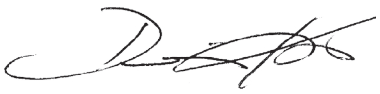
Equipment Type/Environment:
- Measurement, Control and Laboratory Equipment

Trade Name/Model Number:
- SLE1 Sunlite E1

Standard(s) to which Conformity is Declared:
- EN 61326:1998/IEC 61326:1997
  - Electrical Equipment for Measurement, Control and Laboratory Use–EMC Requirements
- EN 55022:1995 (Class-A)
  - Radiated & Line Conducted Emissions Requirements for ITE.
- EN 61010-1
  - Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use –Part 1: General Requirements

Immunity Standard	Description	Severity Applied	Performance Criteria
IEC 1000-4-2 EN 61000-4-2	Electrostatic Discharge	4 kV direct and indirect contact, 4 kV air	C
IEC 1000-4-3 ENV 50140-204	Radiated RF Immunity	3V/m, 80–1000 MHz 80% AM with 1 kHz sine wave	A
IEC 1000-4-4 EN 61000-4-4	Electrical Fast Transient/Burst	+/-1 kV on AC lines,+/-0.5 kV on I/O lines	B
IEC 1000-4-5 ENV 50142	Surge Immunity Test	+/-0.5 kV IM +/-0.5 kV CM1.2ms / 50ms T / Th	B
IEC 1000-4-6 ENV 50141	Conducted RF Immunity	I/O lines > 3 m and AC, DC, and Earth Port lines 3V rms, 0.15 – 80 MHz 150 ohms, 1 kHz 80% AM modulation	A

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.



Full Name: Dennis Koo Position: VP Quality Group

Company: Sunrise Telecom Inc.

Address: 302 Enzo Drive, San Jose, CA 95138 USA

Telephone: (408) 363-8000 Facsimile: (408) 363-8313

Date: 10/20/04

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